

occupied and unoccupied nest clusters, young produced per nest cluster were, respectively, 1.67, 0.86, 0.31, and 0.00 ($P < 0.001$). These and other data could indicate some real decline in the local breeding population and productivity, and/or represent movement of successful breeders from more logged to less logged areas.

INFLUENCE OF PREY ABUNDANCE ON SELECTION OF FORAGING HABITAT BY NORTHERN GOSHAWKS IN A PONDEROSA PINE FOREST

DRENNAN, J.E. *Department of Forestry, Northern Arizona University, Flagstaff, AZ 86011 U.S.A.*

Data are needed to assess the relative importance of prey abundance versus vegetation structure in selection of foraging sites by northern goshawks (*Accipiter gentilis*) in the ponderosa pine vegetation type. Therefore, we radiotagged adult breeding goshawks on the Coconino National Forest in 1993–94, and used precise (± 25 m) radio-locations as centers of 2.25-ha plots, and contrasted prey abundance at these plots to nearby paired plots within the same animal's home range. Thus we studied selection of sites within individual home ranges; Beier (this symposium) measured vegetation structure on these same plots. We indexed abundance of mammalian prey by track stations, and abundance of avian prey by point counts. The track station counts were highly correlated with numbers of chipmunks ($r^2 = 0.79$) and golden-mantled ground squirrels ($r^2 = 0.71$) on 15 plots where live-trapping immediately followed track station sampling. Preliminary results do not suggest that bird or sciurid abundance is an important factor in site selection. Results from about 60 pairs of plots will be presented.

NEST-SITE SELECTION BY NORTHERN GOSHAWKS IN A PONDEROSA PINE FOREST IN EASTCENTRAL ARIZONA

INGRALDI, M.F. *Nongame and Endangered Wildlife Program, Arizona Game and Fish Department, 2221 West Greenway Road, Phoenix, AZ 85023 U.S.A.*

Physical and vegetative characteristics at 20 nest sites of northern goshawks (*Accipiter gentilis*) and 54 random sites on the Sitgreaves National Forest were measured to determine if selection occurs. Nest sites and random plots were limited to the ponderosa pine (*Pinus ponderosa*) habitat type. Survey plots consisted of a 25-m-radius area (main plot) centered around the nest tree or the nearest tree ≥ 30.5 cm dbh to the random point. Canopy cover, basal area, number and dbh of all stems ≥ 30.5 cm, plot aspect, percent slope and ground cover were measured. Within each main plot four randomly selected 4-m-radius satellite plots were established to measure all woody stems < 30.5 cm. Northern goshawks selected larger and taller nest trees ($P < 0.01$ and $P < 0.001$, respectively) with a smaller green crown length ($P < 0.001$) than expected. Northern goshawks selected a nest tree that was part of a

clump ($P < 0.001$) and placed on the lower third of a slope ($P < 0.001$) more often than expected. Canopy cover in the immediate vicinity of the nest tree ($P < 0.05$) and within the main plot ($P < 0.001$) was higher more often than expected. Northern goshawks exhibited an apparent selection for nest placement in stands with mature forest characteristics.

POSTFLEDGING MOVEMENTS OF THE NORTHERN GOSHAWK IN NORTHCENTRAL NEW MEXICO

KENNEDY, P.L. AND J.M. WARD. *Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523 U.S.A.*

The postfledging movements of 42 radio-tagged northern goshawks (*Accipiter gentilis*) from 28 broods were studied in northcentral New Mexico during 1992–93. These 28 broods were part of a food supplementation experiment to determine the influence of extra food on the timing and pattern of dispersal. Half of the broods were given supplemental food from hatching (late April) until mid-October. The remaining broods were controls. Telemetry locations were made approximately every 2 d from fledging until mid-October in 1992 and late November in 1993. During the early fledgling-dependency period (wk 1–4 after fledging) the majority of the juveniles, treatment and controls, were located within 200 m of the nest. From 4–8 wk postfledging the treatment and control juveniles were usually within 1 km of the nest. However, by 11 wk postfledging, most control birds were located > 20 km from their nests. Treatment birds were never located ≥ 30 km from the nest for the duration of the experiment. We conclude that the control birds migrated out of the study area and the treatment birds remained. To our knowledge, this is the first documentation of a change in migration patterns after providing excess food.

GOSHAWKS IN EUROPE AND RANGES IV: SOME RETROSPECTIVE ANALYSES

KENWARD, R.E. *Institute of Terrestrial Ecology, Furzebrook Research Station, Wareham, Dorset BH20 5AS United Kingdom.*

The Ranges IV software for analyzing animal location data was written after completion of a study in Sweden of more than 350 radio-tagged goshawks (*Accipiter gentilis*). Early analyses of goshawk foraging ranges are reviewed. More recent techniques, including sociality indices and compositional analysis, are applied to confirm and enhance the previous findings on winter foraging and habitat use. Contouring, peeled polygons, concave polygons and incremental cluster analyses are used to examine how range size and structure relate to food supply and breeding success in European goshawks. The conclusion provides answers to the question "What can the behavior of radio-